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ABSTRACT

This module is the fourth in a series of eleven modules in an energy conservation curriculum for secondary and postsecondary vocational students. It is designed for use by itself, or as a prerequisite to all or any of the modules in this series. The objective of this module is to train secondary and postsecondary students in the recognition of energy users in the home and the implementation of energy conservation measures to manage energy consumption and energy efficiency. The text emphasizes the importance of recognizing energy users in the home and developing a conscious awareness of energy efficiency and energy management. It discusses the techniques of looking for energy conservation opportunities in the home and preparing checklists for monitoring these opportunities. The information is presented in lecture format accompanied by checklists and illustrations. A bibliography and several handouts supplementing the text material are found at the end of the module. (BM)

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Energy Conservation Curriculum for Secondary and Post-Secondary Vocational Students. Module 4.

HOW TO SEARCH FOR ENERGY CONSERVATION OPPORTUNITIES

BEST COPY AVAILABLE

NAVARRO COLLEGE
CORSICANA, TEXAS

April, 1979

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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NOTE

The small charts, tables, and illustrations contained in the text are reproduced in larger size and included at the end of this document.

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MODULE #4

HOW TO SEARCH FOR ENERGY CONSERVATION OPPORTUNITIES

This module is one of a group of 11 modules in an energy conservation curriculum for secondary and post-secondary vocational students. How to Search for Energy Conservation Opportunities may be offered by itself or as a prerequisite to all or any of the modules in this series. This module is a practical search and identification of energy uses in the home.

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MODULE #4

HOW TO SEARCH FOR ENERGY CONSERVATION OPPORTUNITIES

MODULE DESCRIPTION:

This module emphasizes the importance of recognizing energy users in the home and developing a conscious awareness of energy efficiency and energy management. It discusses the techniques of looking for energy conservation opportunities in the home and preparing checklists for monitoring these opportunities. Such points as usage versus load investigation, occupancy rates, and waste awareness are discussed in this module.

GOAL STATEMENT:

The objective of this module is to train secondary and post-secondary students in the recognition of energy users in the home and the implementation of energy conservation measures to manage energy consumption and energy efficiency.

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MODULE #4

HOW TO SEARCH FOR ENERGY CONSERVATION OPPORTUNITIES

OBJECTIVES: Upon completion of this unit the student will be able to:

1. Identify energy users in the home.

2. Identify and discuss the steps necessary to accomplish energy management.

3. Identify energy management measures available in the home.

LECTURE

LABORATORY

Introduction

Energy conservation is much like being on a diet: it takes concentrated effort and a retaining of philosophy to realize your savings. On a diet we try to lose calories; with energy conservation we try to avoid using calories or to make sure they are used most efficiently.

Learning how to search for energy conservation opportunities is the first step to reaching our ultimate goal: retraining our philosophy to become aware of energy use and energy conservation--that is, become a student of energy management.

Each module in this series will discuss measures each person can take to save energy, either through maintenance, operation, or construction of an energy-using device. This module will concentrate on identifying energy users in the home and developing a plan for effective energy management.

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Step 1 - Walk Through Inspection

The first step is to perform a walk-through inspection. This is simply a cursory inspection to acquaint you with energy users in the home. It may surprise you that there are over 50 items in the home which use energy. Figure 1 will serve as a checklist for this activity. Remember that the objective is to acquaint you with energy users in the home and to help you become familiar with the number of these devices.

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FIGURE 1

APPLIANCE CHECKLIST

Do you know how many energy using devices you have in and around your home? It may surprise you to discover how many you have and how many you use often. Place a check (✓) by the energy using device in your home.

_____adding machine

_____air conditioner, central

_____air conditioner, window

_____attic fan

_____aquarium filter

_____aquarium heater

_____automobile

_____baby food warmer

_____barbeque

_____blanket

_____blender

_____bottle warmer

_____broiler

_____battery charger

_____clothes dryer

_____clothes washer

_____can opener

_____carving knife

_____coffee maker

_____corn popper

_____chain saw

_____clock

_____curling iron

_____calculator

_____charcoal lighter

_____dishwasher

_____deep fat fryer

_____dehumidifier

_____deodorizer

_____dog clippers

_____electrostatic air cleaner

_____evaporative cooler

_____exerciser chair

_____electric drill

_____electric saw

_____food freezer

_____food waste disposer

_____fondue pot

_____food mixer

_____fans

_____floor polisher

_____floor scrubber

_____fireplace log

_____garage door opener

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APPLIANCE CHECKLIST CON'T

_____hot plate

_____hair clippers

_____hair dryer

_____heat lamp

_____heat pad

_____hot comb/brush

_____hot lather dispenser

_____heating unit, central

_____humidifier

_____ice cream freezer

_____iron

_____lighted mirror

_____lawn edger

_____lawn mower

_____hedge trimmer

_____microwave oven

_____massager

_____movie projector

_____radio

_____range, electric or gas

_____refrigerator

_____rug shampooer

_____sewing machine

_____scissors, electric

_____slide projector

_____soldering iron

_____stereo/tape player

_____strobe light

_____swimming pool filter

_____sandwich grill

_____sharpener

_____skillet

_____shaver

_____shoe polisher

_____sun lamp

_____space heaters

_____trash compactor

_____toaster

_____toaster oven

_____toothbrush, electric

_____tape recorder

_____television

_____toys, electric

_____typewriter, electric

_____vaporizer

_____vibrator

_____vacuum cleaner

_____water heater, electric

_____water heat, gas

_____warming tray

_____water pic

_____total number of light bulbs in ceiling fixtures and table lamps

STEP 2 - Amount of Time Used

Once you have identified the number of appliances and energy devices in the home, learn something about them. Go back and observe the operating habits of these appliances. Make note of the length of time each appliance is used and the time of day each is used. This will help you plot the peak demand period for energy in your home.

Look at appliance labels and note wattage for electric appliances and BTU input for gas devices. Using the tables at Figure 2 determine the monthly and annual energy use for these appliances. (See Module #7 for more details on this activity.)

Energy use in the home comes from a large number of different appliances and power devices. The devices listed in Tables 1 and 2 should cover most of the different appliances with their rated and expected power use and the average mean time of use that can be found in the average home assuming normal demand and use of the particular appliance. If one looks down the list and determines which appliances are used in a particular residence and multiplies the wattage by the time of use, the daily kilowatt or watt hours or watt seconds of use can be determined.

An activity which can be used as a laboratory and demonstration exercise in the classroom consists of the following: Take expected times for particular cooking processes or preparation processes and compare the time and energy required for doing this in an oven, microwave oven, slow cooker, and counter top oven toaster using the information given in Tables 1 and 2.

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FIGURE 2

ELECTRIC APPLIANCES

ELECTRIC PRODUCT	TYPICAL WATTAGE	COST	
AIR CONDITIONER			
ROOM			
BEDROOM	900	$ .028*	--HOUR
FAMILY OR LIVING AREA	1500	.046*	--HOUR
MULTIPLE ROOMS	3000	.093*	--HOUR
CENTRAL (EER 8)**			
3 TON	4500	.112*	--HOUR
5 TON	7500	.187*	--HOUR
BABY FOOD WARMER	165	.0012	--10 MINUTES
BLANKET	175	.03*	--NIGHT
BLENDER	385	.0003	--MINUTE
BROILER (PORTABLE)	1500	.031	--30 MINUTES
CAN OPENER	100	.00007	--MINUTE
CARVING KNIFE	92	.0003	--5 MINUTES
CLOCK	2	.06	--MONTH
COFFEE MAKER	850	.0058	--10 MINUTES
COOKER (EGG)	516	.0017	--5 MINUTES
CURLING IRON	40	.0004	--15 MINUTES
CORN POPPER	575	.006	--15 MINUTES
DEEP FAT FRYER	1500	.038	--HOUR
DEHUMIDIFIER	240	.0097	--HOUR
DISHWASHER	1200	.029	--NORMAL CYCLE
DISPOSER	420	.0003	--MINUTE
DRYER	5000		
REGULAR FABRICS		.17	--LOAD
PERMANENT PRESS		.13	--LOAD
ELECTROSTATIC CLEANER	50	1.50	--MONTH (CONTINUOUS FAN OPERATION)

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ELECTRIC HEATING**			
HEAT PUMP (JANUARY AVERAGE)	15000	.105*	--HOUR
BASEBOARD (JANUARY AVERAGE)	15000	.138*	--HOUR
FURNACE (JANUARY AVERAGE)	15000	.159*	--HOUR
FANS			
ATTIC	375	.0151	--HOUR
CIRCULATING	88	.0037	--HOUR
EXHAUST - SMALL	200	.0083	--HOUR
FURNACE (1/3 H.P.)	330	.0096	--HOUR
ROLLABOUT	171	.0070	--HOUR
WINDOW	200	.0086	--HOUR
FLOOR WAXER/CLEANER	350	.0145	--HOUR
FONDUE/CHAFING DISH	800	.016*	--HOUR
FREEZER (15 CU. FT.)	341	4.35*	--MONTH
FROSTLESS (15 CU. FT.)	440	6.10*	--MONTH
FRY PAN	1150	.03*	--HOUR
GARDEN TOOLS			
EDGER	190	.0039	--30 MINUTES
HEDGE TRIMMER	265	.0055	--30 MINUTES
GARAGE DOOR OPENER	350	.00024	--MINUTE
GRINDER (FOOD OR COFFEE)	150	.001	--10 MINUTES
GRIDDLE	1200	.019*	--30 MINUTES
HAIR CLIPPER	10	.00007	--10 MINUTES
HAIR DRYER			
SOFT BONNET	400	.0166	--HOUR
HARD BONNET	900	.0374	--HOUR
HAND HELD	600	.0249	--HOUR
HAIR ROLLERS	350	.0036	--15 MINUTES
HEAT LAMP	250	.0104	--HOUR
HEATING PAD	65	.0015*	--HOUR
HI-FI/STEREO	100	.00415	--HOUR
HOT PLATE	1250	.026	--30 MINUTES
HUMIDIFIER	175	.02	--DAY
ICE CREAM FREEZER	130	.004	--45 MINUTES
ICE CRUSHER	120	.00041	--5 MINUTES
IRON	1000	.0228*	--HOUR

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Juicer	90	.00006	--minute
Knife Sharpener	100	.00035	--5 minutes
Lights*** - 100-watt bulb	100	.0415	--10 hours
Make-up Mirror	25	.00026	--15 minutes
Microwave Oven	1500	.005	--5 minutes
Mixer			
Hand	100	.0021	--30 minutes
Standing	150	.0031	--30 minutes
Motors****			
1/6 h.p.	170	.0004	--5 minutes
1/4 h.p.	250	.0006	--5 minutes
1/3 h.p.	330	.0008	--5 minutes
1/2 h.p.	500	.0012	--5 minutes
1 h.p.	1000	.0024	--5 minutes
Power Tools			
Drill (1/4 inch)	240	.0009	--5 minutes
Jig Saw	370	.00128	--5 minutes
Radio	75	.0031	--hour
Range			
Small Surface Unit	1300	.015	--15 minutes (high heat)
Large Surface Unit	2400	.009	--5 minutes (high heat)
Oven (non-self-cleaning)	3200	.043*	--hour
(self-cleaning)	3200	.034*	--hour
Broiler Unit	3600	.037	--15 minutes
Self-Cleaning Feature	4000	.15-.25*	--2 hours
Refrigerator/Freezer (14 cu. ft.)	330	4.16*	--month
Frostless	615	6.35*	--month
Roaster	1350	.034*	--hour
Sewing Machine	75	.0031	--hour
Shaver	14	.00005	--5 minutes
Shaving Cream Dispenser (Heated)	60	.00004	--minute

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Slow Cooker - Low	75	.0031	--hour
High	150	.0062	--hour
Space Heater	1300	.054	--hour
Sump Pump (1/3 h.p.)	330	.0096	--hour
Sun Lamp	250	.0017	--10 minutes
Television			
Black & White	160	.0066	--hour
Solid State	55	.0023	--hour
Color	300	.013	--hour
Solid State	200	.0083	--hour
Toaster	1200	.0016	--2 minutes
Toothbrush	7	.000005	--minute
Trash Compactor	400	.0014	--5 minutes
Vacuum Cleaner	650	.027	--hour
Vaporizer			
Cool Mist	60	.0025	--hour
Steam	480	.0200	--hour
Waffle Iron	1200	.02*	--30 minutes
Warming Tray	140	.006	--hour
Washing Machine (Automatic)	500	.011	--normal load
Water Heater (Quick Recovery)	4500	.10-.20	--per person/day
Yard or Post Lights			
175w Mercury (Bulb & Ballast)	196	.09	--night
100w Incandescent (Both based on photo-cell control--normal operating hours for one year -- 4,000)	100	.05	--night

Note: Costs exclude 3% sales tax.

* Thermostatically controlled. Cost based upon estimated percentage of "On" time.

** ELECTRIC HEATING AND CENTRAL AIR CONDITIONING COSTS VARY WITH EACH INDIVIDUAL HOME. MANY FACTORS ARE NEEDED TO ARRIVE AT AN ACCURATE ESTIMATE: SIZE OF HOME, TYPE OF SYSTEM, AMOUNT OF INSULATION, NUMBER OF DOORS, WINDOWS, ETC.

*** MANY FACTORS AFFECT LIGHTING COSTS: SIZE OF THE HOME, TYPE OF LIGHTING, ETC. BUT KEEP IN MIND -- FLUORESCENT LIGHTS ARE MORE EFFICIENT AND MORE ECONOMICAL TO OPERATE.

**** MOTORS FOR FURNACES, APPLIANCES, TOOLS, PUMPS, ETC. ARE RATED BY OUTPUT HORSEPOWER (H.P.), BUT DEPENDING ON SIZE, QUALITY AND LOAD CHARACTERISTICS THE WATTAGE RATING VARIES. IN GENERAL, 1 H.P. OUTPUT EQUALS 1000 WATTS INPUT AT FULL LOAD. HOWEVER, MOTORS ARE GENERALLY SIZED TO RUN AT 70% FULL LOAD.

GAS APPLIANCES

GAS APPLIANCE	TYPICAL GAS INPUT RATING CFH	COST	
AIR CONDITIONERS**			
CENTRAL 3 TON	80	.140*	--HOUR
CENTRAL 5 TON	135	.235*	--HOUR
DRYER			
REGULAR FABRICS	25	.062*	--LOAD
PERMANENT PRESS	18	.050*	--LOAD
FURNACE**			
(JANUARY AVERAGE)	137	.073*	--HOUR
OUTDOOR GRILL (FULL HEAT)	25	.0242	--30 MINUTES
RANGE			
SURFACE UNIT	6	.001	--5 MINUTES
OVEN	30	.030*	--HOUR
WATER HEATER	37	.05-.10	--PER PERSON/DAY
YARD LIGHT	2	.092	--DAY

NOTE: COST INCLUDES BOTH GAS AND ASSOCIATED ELECTRICAL ENERGY USE FOR APPLIANCES, BUT EXCLUDES 3% SALES TAX.

* THERMOSTATICALLY CONTROLLED. COST BASED UPON ESTIMATED PERCENTAGE OF "ON" TIME.

** NATURAL GAS HEATING AND AIR CONDITIONING COSTS VARY WITH EACH INDIVIDUAL HOME. MANY FACTORS ARE NEEDED TO ARRIVE AT AN ACCURATE ESTIMATE: SIZE OF HOME, TYPE OF SYSTEM, AMOUNT OF INSULATION, NUMBER OF DOORS, WINDOWS, ETC.

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Step 3 - Meter Readings

(Refer to Module #5 to learn how to read a utility meter.)

Take note of electric and gas meter readings at the beginning of each of five days. Before retiring for the night read the meters again. Plot the amount of energy used for each of these five days and each of these five nights. Note the differences in energy use for each of these five nights and days. Can you begin to think of reasons which have caused these differences?

1. Operation practices
2. Particular activities on one day versus another day
3. An increase or decrease in the number of people in the home
4. A variance in weather temperature and conditions
5. A change in personal health conditions

This is your first major step in developing an energy management awareness.

Over a period of a couple of days each student should, after having learned in the previous sections to read an electric or gas meter, read the electric power and gas consumption on the smaller dials at hourly intervals for at least two days and plot this information. In periods of high demand use the student should read at fairly short intervals. This can be done for more than one season or for different types of weather days. Students can determine which appliances use large amounts of power by working as teams and either opening refrigerator doors, starting up the furnace or air conditioner by adjusting the thermostat, or waiting until they turn on to see how fast the meter moves and how much power is used per minute for the different types of appliances. The student can also leave a door or window open to see how infiltration rates increase the amount of time that a furnace runs.

Using the data included in the laboratory module and class modules, they should determine what their expected power use is as a function of the appliances they use in their home. To do this, they should look at the hourly expected distributions and couple this with the watt and currents that they have taken off the electrical power consumption tags and stickers on the appliances used. This will be done using information covered in previous modules and class presentation. After having plotted what their actual energy use is, they should plot a scenario of what they believe a maximum energy use could be for their home. They should also plot an energy use reduction which follows the

recommendations they have learned in this and previous modules. Students should then compare all three curves to find out whether they are a medium, a high, or a low power use compared between what they consider a maximum potential use and the minimum optimum use they have previously plotted.

Step 4 - Historical Usage Data

It is now necessary to compare energy used for this month with energy used last month and with energy used this month last year. In order to be energy conscious the student must know what the energy demands are in the home so that monitoring them can result in a change in operating habits, maintenance, or kind of appliances used and reduce the amount of energy consumed.

Step 5 - Prioritize the Energy Use

Look at the survey taken and indicate the appliances and devices which require the most energy. Based on the list at Figure 3, survey your home for energy conservation measures you have done or can do to make your energy consumption more efficient.

Students should proceed before a specifically assigned class to gather copies of at least one and preferably two years of utility bills used by their family. The actual dollar amounts are of no interest in this exercise. The student should get the kilowatt/hours of electricity and the thousand cubic feet of natural gas that were billed for each month from the receipts. It would be helpful also for the water consumption bills for the same period to also be tallied with respect to the number of gallons or number of cubic feet of water used.

In this activity, the students are to use graph paper to plot the monthly power requirements; namely the electricity and gas used, as a function of months of the year. They should put, per the example in Figure 2, the months along the ordinate and the gas use u thep right hand abscissa and th e electric use up the left hand abscissa.

Once this has been plotted the students should determine what the base line loads are as a function of season and the overall yearly base line load. This is the power demand at the minimum period during the whole year or the minimum power

required for the period of either the winter heating or the summer cooling season. Students should also determine the peak profile structure and the peak demands for power.

The information will give them an idea of what power use demands are in their particular home.

FIGURE 3

A SUMMARY OF ENERGY CONSERVATION METHODS
FOR VARIOUS APPLICATIONS AND ACTIVITIES

After considering the conservation aspects of all the models and specifics of this module, one can summarize in numerical form what the better conservation activities and lifestyle approaches are that help reduce energy costs and utility bills. In general, you as a customer benefit from energy conservation because it:

1. cuts down on your utility and gasoline bills,
2. if you save energy, you help fight against pollution,
3. if you don't save natural gas, petroleum and electricity now, some day none may be available.

The energy conservation methods are grouped under specific appliances and uses. The first list is for general residential and small commercial use, and the second list is for industrial and business use. However, many of the energy conservation practices for business and industry are directly applicable to the home; especially people who have electrical-electronic and audio-visual equipment.

GENERAL RESIDENTIAL AND SMALL COMMERCIAL

Heating

1. In cooler months of the year, set your thermostat at 68° during the daytime, several degrees lower at night (an extra blanket on your bed can make up the difference).
2. Set your thermostat at a comfortable temperature, then leave it alone...turning it up and down wastes energy.
3 Make sure your home has adequate insulation -- install storm windows and doors if you don't have them. Three inches of insulation in attic can save as much as 25% on heating cost over no insulation.
4. Avoid frequent opening of outside doors. Use weatherstripping to seal air leaks around edges.
5. In winter, keep your drapes open to let the sunlight in during the day, close them at night to stop cold drafts.
6. Keep the damper on your chimney closed when not in use.
7. Turn off heat vents and close off rooms that are not in use.
8. Keep filters clean...change them at least twice a year.
9. Consider a switch to solar heating in the future.
10. Remove furniture, rugs, etc., that block heating vents or radiators.
11. Place aluminum foil between radiator and exterior wall to reflect heat into the house.

Air Conditioning

1. During hot months, set your air conditioner on "low" or keep your thermostat at 72° or more...this way you'll use less electricity and feel less uncomfortable when you step outdoors.
2. In summer, close drapes to keep sunlight out (this makes it easier for the air conditioner to keep things cool).
3. If you have a window air conditioner, try to place it in the window with the most shade.
4. Use heat producing major appliances (dishwashers, dryers, ovens, etc.) during early morning or evening...not when your air conditioner is working the hardest.
5. Keep doors and windows closed when air conditioner is operating...and close off unused area.
6. Keep filters clean.
7. Set the thermostat higher if you are away most of the day and turn it off if you're going away for a weekend or longer.
8. Storm windows will help keep the cool air inside.
9. To ease the load on your air conditioning system, consider installing an attic fan to help blow out the trapped hot air.
10. Make sure sofas, bookcase and other solid objects do not obstruct your air conditioner to keep it from operating efficiently.

Hot Water

1. Set your water heater's thermostat at "medium".
2. Encourage showers instead of tub baths to save hot water.
3. Fix leaky faucets (a drip a second wastes 700 gallons a year).
4. Don't wash dishes under running water...a dishwasher uses much less hot water than washing dishes by hand.
5. Run washing machine, dryer, and dishwasher only with full loads. Wash clothes in cold water whenever possible.
6. When on vacation use the water heater's vacation setting. The pilot light will keep burning without using more energy to heat water.
7. Don't waste hot water. For example, don't leave water running while washing hands or shaving--partially fill the basin first.

Lighting

1. Turn off lights when not needed.
2. Keep light bulbs and fixtures clean...that way you may require fewer bulbs.
3. When possible, use fluorescent lamps. A 40-watt fluorescent lamp produces more light than a 100-watt incandescent bulb.
4. Install dimmer controls to save energy and add atmosphere.
5. Rooms with pastel walls and a light-colored interior decor usually require fewer lamps.

Major Appliances - Stove

1. Partially thaw frozen foods before cooking.
2. Put small pots on small burners, large ones on large burners.
3. Cover pots to avoid heat loss.
4. Use high setting on units to start, then reduce heat and food will continue to boil.
5. When cooking with water, use as little as possible so food will heat quickly.
6. When using the oven, preheat only 10 minutes...and don't peek. The oven uses less energy than the stove top because it is a confined space.
7. Avoid using aluminum foil on shelves directly under pans since it can reflect the heat away from them.
8. Cook by time and temperature. A meat thermometer can eliminate over-cooking. Precise timing eliminates wasted heat by peeking.
9. In summer, cook outdoors whenever possible to reduce heat build-up inside. Experiment with a solar cooker.
10. When using gas, regulate burners so flame tips just touch utensil bottoms.
11. A clean oven and broiler cooks more efficiently.
12. Ceramic, glass and stainless steel are best heat retainers (lower oven temperatures by 25°).

Major Appliances - Refrigerator/Freezer

1. Locate refrigerator out of sun and away from heat sources (stove, dishwasher, etc.)
2. Cool foods to room temperature before placing them in refrigerator.
3. Make sure gasket seals door well.
4. Defrost freezer when 1/4" of frost has built up.
5. Keep freezer full, but not overloaded: it uses less energy to keep freezer cold when air can easily circulate around packages.
6. Chill food before placing it in freezer...and don't freeze too many things at once.
7. A chest freezer is more economical than an upright because when the door is opened the cold air settles on the bottom, rather than flowing onto the floor.
8. To avoid excess cold loss, open refrigerator or freezer only when necessary.
9. Check the temperature setting of your refrigerator and freezer against your appliance manual. If you store your food too cold, you will be wasting energy.
10. When preparing to go on vacation, set refrigerator at a warmer temperature and leave it fairly empty.

Major Appliances - Washer & Dryer

1. Keep the lint traps clean to assure top efficiency.
2. Use only when full and as cool a setting as possible (DO NOT OVERLOAD).
3. Use the water level control on your washer...small loads require less hot water.

4. Don't overdry clothes. Save ironing by hanging or folding clothes as soon as they are dry.
5. Your dryer should be located where it has easy access to clean dry air.
6. Use the free solar energy whenever possible.
7. Soak stubborn stains before washing.
8. Check type of soiling and fabric--when possible wash clothes in cold water (except diapers).

Transportation

1. Reduce the amount of driving you must do...instead of 5 or 6 short trips make one well-planned and organized trip.
2. Use car pools to get to work, take kids to school, or even for shopping trips.
3. Use public transportation whenever possible.
4. Use a bicycle for short trips...uses less energy and keeps you in shape at the same time. Or walk.
5. Consider buying a smaller, more efficient car.

Automobile

1. Avoid jack rabbit starts and sudden stops to save gas.
2. Weaving in and out of traffic wastes fuel and can cause needless accidents.
3. Don't waste gasoline by keeping your car running while waiting for someone.
4. Try to hold a constant speed when possible.
5. On hot summer days, park in the shade so the air conditioner doesn't have to work as hard. When possible, drive with the windows open instead of using the air conditioner.
6. Keep your car in top shape...have it tuned regularly.
7. Make sure your tires are properly inflated so you get running errands.
8. If you are a 2-car family, use the smaller one for running errands.
9. Change oil and oil filters every 3,000 to 6,000 miles (according to your owner's manual). A dirty engine wastes gas.
10. Improper wheel alignment cuts down on power, gas mileage and tire mileage!

Appliances - General

1. Follow detergent directions carefully, oversudsing in both dishwashers and washers uses extra energy, because the equipment has to work harder.
2. Use small appliances where possible, rather than large ones. For example, an electric fry pan uses less energy to cook a one pot meal than an electric range.
3. Iron all clothes at the same time to avoid reheating iron later in day or several times in one week.
4. Have gas appliances cleaned regularly so they will always operate at top efficiency.
5. Motor driven appliances, like mixers, are particularly economical.

General

1. Color TV's use more energy than black and white TV's.
2. Always turn off a radio, TV, or record player when no one is watching or listening.
3. When possible use your major appliances during off-peak hours (before 8 a.m. and after 6 p.m.), when commercial and industrial use is less.
4. Keep your swimming pool in top operating condition so it doesn't waste energy.
5. Recycle aluminum, paper, and glass whenever possible.
6. Watch how you water your lawn...a lot of water is wasted when a lawn is saturated and the water starts running into the street.
7. Avoid using extension cords for major appliances and don't overload circuits. Overloading causes reduced energy efficiency.
8. Make your family aware of the energy problem and what they can do about it!

INDUSTRIAL AND BUSINESS

Heating

1. Make sure sufficient insulation is installed.
2. Do not overheat areas...keep the thermostat set at 68° or slightly lower during the winter. (66-70° is recommended for factory areas, 72-74° for general office areas.)
3. Cut heat leakage from building by using caulking and weather stripping around doors and windows.
4. Make sure heat is not left on too far into spring.
5. Reduce or turn off heat in unused areas (warehouses, docks, etc.).
6. Have a control on outside doors so they are not left open during the winter...heating the outdoors.
7. Reduce heating during those times when the space is unoccupied.
8. Check with equipment suppliers or qualified engineers to determine the extent to which your heating, ventilating and air conditioning equipment is suited for its job...is it the best?
9. Consider the practicality of infra-red heaters in high bay areas and warehouses. (It requires less fuel than other kinds of heating because it only heats solid objects in its path...not the air in between.)

Cooling

1. Do not overcool areas...keep the thermostat set at 72° or higher during the summer.
2. Spraying water on building roofs can reduce the effect of solar heat in warm weather.
3. Close off unused areas that do not require cooling.
4. Control outside doors so they are not left open during the summer...cooling the outdoors.

Maintenance

1. Emphasize boiler maintenance. Cleanliness improves its operation.
2. Check stack temperature to make sure you are getting complete combustion.
3. Check the insulation on heat/cold pipes--do machines have to work extra hard because of leaks or a lack of proper insulation.
4. Inspect heat transfer surfaces regularly to make sure they are clean...insuring top efficiency.
5. Be on the alert for hot spots and deterioration in furnaces and pipe systems. (Air leaking into furnaces can cause large losses.)
6. Make sure furnace controls and burners are maintained for best efficiency.

Electricity

1. Turn off lights in empty rooms except where needed for safety and security (i.e. washroom lights).
2. Where possible use fluorescent lighting rather than incandescent bulbs (you get more lighting for less watts).
3. Turn off electrical equipment when not in actual use (i.e. typewriter while you're on the telephone).
4. Check and justify weekend electrical power usage.
5. Are motor actuating controls in proper condition so that motors don't operate unnecessarily?
6. Install automatic controls for outdoor and indoor lighting so electricity is not wasted when it is not needed.
7. Convert to higher voltage electrical systems where practical.

Transportation

1. Reduce amount of driving necessary...instead of many short trips organize errands into one well-planned and organized trip.
2. Encourage car pools and the use of public transportation.
3. Whenever possible ship freight by railroad rather than by air...it requires less energy.
4. Keep company cars and trucks in top-shape...have them turned regularly.

Operations

1. Avoid short runs on thermal process equipment when possible and shut down or idle equipment during production interruptions.
2. In many areas, energy waste is often the result of long unquestioned plant practices that can be shown to have no effect on employee performance or product dependability... re-evaluate.
3. Schedule loads so equipment operates at the top level of efficiency.

4. If possible, reschedule some electrical usage to off-peak periods when voltage remains high. (Before 8 a.m. or after 6 p.m.)

General

1. Waste heat from burner stacks and industrial processes can often be recovered and used.
2. Recycle waste materials (sawdust, oil, etc.) as supplemental fuels where possible.
3. Consider the use of heat pipes for transporting required heat or dissipating unwanted excess heat.
4. Check for accuracy of deliveries of oil, gases, etc.
5. Investigate "new" forms of energy.

These lists were developed using material from the Edmund Scientific Company Manual No. 9903.

Step 6 - Prioritize Energy Solutions

Some energy conservation measures are expensive while others require no expense at all (turning down a thermostat). Prioritize the energy measures which require expense in order to devise a scheme for implementing them. Some measures may be too expensive to implement at present while others may be too expensive to even consider in terms of payback. (Refer to Module #11 for cost factors and information.)

Summary

Effective energy management requires work. It is a two part activity: first, recognize your problem: second, do something about it.

Energy management requires surveying usage periodically, keeping records, and prioritizing energy solution measures. Once the student understands this process of energy management, or how to search for energy conservataion opportunities, he or she will be able to realize energy and monetary savings.

To determine the energy efficiency of your home as a building, complete the survey form at Figure 4 and discuss it in class.

FIGURE 4

E-OK ENERGY EFFICIENT

The N.E.W. Way to an Energy Efficient Home

Rating Sheet

STRUCTURAL ENERGY INTEGRITY ITEMS	Assigned Points	Structural Points
GLASS AREAS (Windows, French and Patio Doors, etc.)		
A. Percent of Glass Area to Floor Area		
Less than 8%	20	
8% to less than 10%	17	
10% to less than 12%	12	
12% to less than 15%	6	
15% to less than 20%	0	
20% to less than 25%	−15	
Greater than 25%	−30	_____
B. Type and Amount of Glass		
Single Glazed	0	
Storm or Double Glazed without Thermal Break		
100% of Glass Area	20	
80% to less than 100% of Glass Area	16	
60% to less than 80% of Glass Area	12	
40% to less than 60% of Glass Area	8	
20% to less than 40% of Glass Area	4	
Less than 20% of Glass Area	0	
Storm or Double Glazed with Thermal Break		
100% of Glass Area	25	
80% to less than 100% of Glass Area	20	
60% to less than 80% of Glass Area	15	
40% to less than 60% of Glass Area	10	
20% to less than 40% of Glass Area	5	
Less than 20% of Glass Area	0	_____
EXTERIOR DOORS (Other Than Glass)		
Solid or Hollow Core	0	
Insulated or Storm Door	4	_____
FLOORS		
Monolithic Slab - with no Perimeter Insulation	0	
Monolithic Slab - with R-5 Perimeter Insulation	5	
Pier & Beam with R-11 Insulation	0	
Pier & Beam with R-19 Insulation	10	
Pier & Beam with Less than R-11 Insulation	−15	_____
OUTSIDE WALLS		
Less than R-7 Insulation Installed	−20	
Less than R-11 Insulation Installed	−10	
R-11 Insulation Installed	0	
R-[illegible] Insulation Installed	10	
R-[illegible] Insulation Installed	15	
R-[illegible] Insulation Installed	17	
R-23 Insulation Installed	20	_____
CEILINGS OVER CONDITIONED AREAS		
R-[illegible] Insulation Installed	0	
R-22 Insulation Installed	12	
R-26 Insulation Installed	20	
R-30 Insulation Installed	25	
R-[illegible] Insulation Installed	30	_____
INFILTRATION OF UNCONDITIONED AIR *		
A. Soleplate Sealed	13	_____
B. Wiring & Plumbing Holes and Furrdowns Sealed	10	_____
C. Exterior Doors & Windows Weather Stripped	3	_____
D. Exterior Doors & Windows Rough Opening Caulked	6	_____
E. Attic Access in Conditioned Space Weather Stripped	2	_____
F. Outside Sheathing Holes Sealed and Polyethylene Film** Installed	3	_____
G. Ventless or Dampered Range Hood Installed	3	_____
FIREPLACES		
No Fireplace	10	
Fireplace with Damper, Glass Screen & Make Up Air Intake	8	
Fireplace with Damper & Make Up Air Intake	5	
Fireplace with Damper	0	
Fireplace without Damper	−15	_____
STRUCTURAL ITEMS SUB-TOTAL Required Points 90		

MECHANICAL SYSTEM ITEMS	Assigned Points	Mechanical Points
8. ATTIC VENTILATION REQUIREMENT (See Table for Vent Area Required)		
With no Air Handler and/or Duct System in the Attic - 0.4 to 1.0 cfm per sq. ft. of Attic Floor Area "OR"		
With Air Handler and/or Duct System in the Attic - 1.5 to 2.0 cfm per sq. ft. of Attic Floor Area	5	_____
9. DUCT SYSTEM		
Attic Space R-7 Sealed Joints	0	
Attic Space R-14 Sealed Joints	5	
Unconditioned Space or Partial Conditioned	5	
None or Conditioned Space (R-4)	15	_____
10. AIR HANDLER AND/OR HEATING UNIT LOCATION		
Attic Space	0	
Unconditioned Space (Combustion Air to Closet puts the Unit in an Unconditioned Space)	5	
Conditioned Space	15	_____
11. COOLING EFFICIENCIES (Unitary, Window Units, & Heat Pumps) at 95° Outdoor Temperature (ARI Rating or AHAM)		
A. 7.0 EER	0	
7.1 to less than 7.5	5	
7.5 to less than 8.0	10	
8.0 to less than 8.5	15	
8.5 to less than 9.0	20	
9.0 to less than 9.5	25	
9.5 or Greater EER	30	_____
B. Single Unit	0	
Multiple Unit	5	_____
12. HEATING EFFICIENCIES @ 47° Outdoor Temperature		
COP .5 to less than 1.0	0	
1.0 to less than 2.0	8	
2.0 to less than 2.5	12	
2.5 to less than 3.0	16	
3.0 to less than 3.5	20	
3.5 or Greater	24	_____
13. WATER HEATING SYSTEM		
A. Pipe Insulation		
Lines Insulation - Non Circ. System (R-4)	5	
Not Insulated - Non Circ. System	0	
Circ. System	−50	_____
B. Water Heating Location		
Located within 20 ft. of Kitchen & Utility Area	3	_____
C. Heat Recovery or Solar Water Heating	15	_____
STRUCTURAL & MECHANICAL ITEMS TOTAL Required Points 135		

Remember, an E-OK home must earn at least 135 points, and a minimum of 90 of these points must be achieved in construction categories 1 through 7. If the original point rating of your present home in categories 1 through 7 has been increased by a minimum of 35 points, you still qualify for the N.E.W. program.

*The right is reserved to test the structure for infiltration when less than one air change per hour is claimed by Point System.

**This is mandatory when a High Order Vapor Barrier is used on the outside wall.

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MODULE #4

HOW TO SEARCH FOR ENERGY CONSERVATION OPPORTUNITIES

BIBLIOGRAPHY

E-OK: The N.E.W. Way to an Energy-Efficient Home, Texas Power and Light Company.

McAtee, Lynda, Watts Watching, College Station, Texas, Energy Conservation Resources for Education, 1976.

McLemore, Charles C., Hey Willie, You Left the Lights On! College Station, Texas, Energy Conservation Resources for Education, 1976.

Ninety-Nine Ways to a Simple Lifestyle, Center for Science in the Public Interest, Garden City, New York, Anchor Books, 1977.

Price, Billy L. and James T., Homeowner's Guide to Saving Energy, Blue Ridge Summit, PA, Tab Books, 1976.

Realizing Energy Savings: An Office Building Workshop, Federal Energy Administration, Minneapolis Workshop, January 1977.

Schiller, Carol Ann, Home Energy Management Checklist, NECEP Journal, December 1978, pp. 16-19.

Tips for Energy Savers, Washington, DC, Department of Energy (Federal Energy Administration) FEA/D-77/212, August 1977.

FIGURE 1

APPLIANCE CHECKLIST

Do you know how many energy using devices you have in and around your home? It may surprise you to discover how many you have and how many you use often. Place a check (✓) by the energy using device in your home.

_____adding machine

_____air conditioner, central

_____air conditioner, window

_____attic fan

_____aquarium filter

_____aquarium heater

_____automobile

_____baby food warmer

_____barbeque

_____blanket

_____blender

_____bottle warmer

_____broiler

_____battery charger

_____clothes dryer

_____clothes washer

_____can opener

_____carving knife

_____coffee maker

_____corn popper

_____chain saw

_____clock

_____curling iron

_____calculator

_____charcoal lighter

_____dishwasher

_____deep fat fryer

_____dehumidifier

_____deodorizer

_____dog clippers

_____electrostatic air cleaner

_____evaporative cooler

_____exerciser chair

_____electric drill

_____electric saw

_____food freezer

_____food waste disposer

_____fondue pot

_____food mixer

_____fans

_____floor polisher

_____floor scrubber

_____fireplace log

_____garage door opener

APPLIANCE CHECKLIST CON'T

_____hot plate

_____hair clippers

_____hair dryer

_____heat lamp

_____heat pad

_____hot comb/brush

_____hot lather dispenser

_____heating unit, central

_____humidifier

_____ice cream freezer

_____iron

_____lighted mirror

_____lawn edger

_____lawn mower

_____hedge trimmer

_____microwave oven

_____massager

_____movie projector

_____radio

_____range, electric or gas

_____refrigerator

_____rug shampooer

_____sewing machine

_____scissors, electric

_____slide projector

_____soldering iron

_____stereo/tape player

_____strobe light

_____swimming pool filter

_____sandwich grill

_____sharpener

_____skillet

_____shaver

_____shoe polisher

_____sun lamp

_____space heaters

_____trash compactor

_____toaster

_____toaster oven

_____toothbrush, electric

_____tape recorder

_____television

_____toys, electric

_____typewriter, electric

_____vaporizer

_____vibrator

_____vacuum cleaner

_____water heater, electric

_____water heat, gas

_____warming tray

_____water pic

_____total number of light bulbs in ceiling fixtures and table lamps

FIGURE 2

ELECTRIC APPLIANCES

ELECTRIC PRODUCT	TYPICAL WATTAGE	COST	
AIR CONDITIONER			
ROOM			
BEDROOM	900	$ .028*	--HOUR
FAMILY OR LIVING AREA	1500	.046*	--HOUR
MULTIPLE ROOMS	3000	.093*	--HOUR
CENTRAL (EER 8)**			
3 TON	4500	.112*	--HOUR
5 TON	7500	.187*	--HOUR
BABY FOOD WARMER	165	.0012	--10 MINUTES
BLANKET	175	.03*	--NIGHT
BLENDER	385	.0003	--MINUTE
BROILER (PORTABLE)	1500	.031	--30 MINUTES
CAN OPENER	100	.00007	--MINUTE
CARVING KNIFE	92	.0003	--5 MINUTES
CLOCK	2	.06	--MONTH
COFFEE MAKER	850	.0058	--10 MINUTES
COOKER (EGG)	516	.0017	--5 MINUTES
CURLING IRON	40	.0004	--15 MINUTES
CORN POPPER	575	.006	--15 MINUTES
DEEP FAT FRYER	1500	.038	--HOUR
DEHUMIDIFIER	240	.0097	--HOUR
DISHWASHER	1200	.029	--NORMAL CYCLE
DISPOSER	420	.0003	--MINUTE
DRYER	5000		
REGULAR FABRICS		.17	--LOAD
PERMANENT PRESS		.13	--LOAD
ELECTROSTATIC CLEANER	50	1.50	--MONTH (CONTINUOUS FAN OPERATION)

C

ELECTRIC HEATING**			
HEAT PUMP (JANUARY AVERAGE)	15000	.105*	--HOUR
BASEBOARD (JANUARY AVERAGE)	15000	.138*	--HOUR
FURNACE (JANUARY AVERAGE)	15000	.159*	--HOUR
FANS			
ATTIC	375	.0151	--HOUR
CIRCULATING	88	.0037	--HOUR
EXHAUST - SMALL	200	.0083	--HOUR
FURNACE (1/3 H.P.)	330	.0096	--HOUR
ROLLABOUT	171	.0070	--HOUR
WINDOW	200	.0086	--HOUR
FLOOR WAXER/CLEANER	350	.0145	--HOUR
FONDUE/CHAFING DISH	800	.016*	--HOUR
FREEZER (15 CU. FT.)	341	4.35*	--MONTH
FROSTLESS (15 CU. FT.)	440	6.10*	--MONTH
FRY PAN	1150	.03*	--HOUR
GARDEN TOOLS			
EDGER	190	.0039	--30 MINUTES
HEDGE TRIMMER	265	.0055	--30 MINUTES
GARAGE DOOR OPENER	350	.00024	--MINUTE
GRINDER (FOOD OR COFFEE)	150	.001	--10 MINUTES
GRIDDLE	1200	.019*	--30 MINUTES
HAIR CLIPPER	10	.00007	--10 MINUTES
HAIR DRYER			
SOFT BONNET	400	.0166	--HOUR
HARD BONNET	900	.0374	--HOUR
HAND HELD	600	.0249	--HOUR
HAIR ROLLERS	350	.0036	--15 MINUTES
HEAT LAMP	250	.0104	--HOUR
HEATING PAD	65	.0015*	--HOUR
HI-FI/STEREO	100	.00415	--HOUR
HOT PLATE	1250	.026	--30 MINUTES
HUMIDIFIER	175	.02	--DAY
ICE CREAM FREEZER	130	.004	--45 MINUTES
ICE CRUSHER	120	.00041	--5 MINUTES
IRON	1000	.0228*	--HOUR

Juicer	90	.00006	--minute
Knife Sharpener	100	.00035	--5 minutes
Lights*** - 100-watt bulb	100	.0415	--10 hours
Make-up Mirror	25	.00026	--15 minutes
Microwave Oven	1500	.005	--5 minutes
Mixer			
Hand	100	.0021	--30 minutes
Standing	150	.0031	--30 minutes
Motors****			
1/6 h.p.	170	.0004	--5 minutes
1/4 h.p.	250	.0006	--5 minutes
1/3 h.p.	330	.0008	--5 minutes
1/2 h.p.	500	.0012	--5 minutes
1 h.p.	1000	.0024	--5 minutes
Power Tools			
Drill (1/4 inch)	240	.0009	--5 minutes
Jig Saw	370	.00128	--5 minutes
Radio	75	.0031	--hour
Range			
Small Surface Unit	1300	.015	--15 minutes (high heat)
Large Surface Unit	2400	.009	--5 minutes (high heat)
Oven (non-self-cleaning)	3200	.043*	--hour
(self-cleaning)	3200	.034*	--hour
Broiler Unit	3600	.037	--15 minutes
Self-Cleaning Feature	4000	.15-.25*	--2 hours
Refrigerator/Freezer			
(14 cu. ft.)	330	4.16*	--month
Frostless	615	6.35*	--month
Roaster	1350	.034*	--hour
Sewing Machine	75	.0031	--hour
Shaver	14	.00005	--5 minutes
Shaving Cream Dispenser (Heated)	60	.00004	--minute

Slow Cooker - Low	75	.0031	--hour
High	150	.0062	--hour
Space Heater	1300	.054	--hour
Sump Pump (1/3 h.p.)	330	.0096	--hour
Sun Lamp	250	.0017	--10 minutes
Television			
Black & White	160	.0066	--hour
Solid State	55	.0023	--hour
Color	300	.013	--hour
Solid State	200	.0083	--hour
Toaster	1200	.0016	--2 minutes
Toothbrush	7	.000005	--minute
Trash Compactor	400	.0014	--5 minutes
Vacuum Cleaner	650	.027	--hour
Vaporizer			
Cool Mist	60	.0025	--hour
Steam	480	.0200	--hour
Waffle Iron	1200	.02*	--30 minutes
Warming Tray	140	.006	--hour
Washing Machine (Automatic)	500	.011	--normal load
Water Heater (Quick Recovery)	4500	.10-.20	--per person/day
Yard or Post Lights			
175w Mercury (Bulb & Ballast)	196	.09	--night
100w Incandescent (Both based on photo-cell control--normal operating hours for one year -- 4,000)	100	.05	--night

Note: Costs exclude 3% sales tax.

* Thermostatically controlled. Cost based upon estimated percentage of "On" time.

** ELECTRIC HEATING AND CENTRAL AIR CONDITIONING COSTS VARY WITH EACH INDIVIDUAL HOME. MANY FACTORS ARE NEEDED TO ARRIVE AT AN ACCURATE ESTIMATE: SIZE OF HOME, TYPE OF SYSTEM, AMOUNT OF INSULATION, NUMBER OF DOORS, WINDOWS, ETC.

*** MANY FACTORS AFFECT LIGHTING COSTS: SIZE OF THE HOME, TYPE OF LIGHTING, ETC. BUT KEEP IN MIND -- FLUORESCENT LIGHTS ARE MORE EFFICIENT AND MORE ECONOMICAL TO OPERATE.

**** MOTORS FOR FURNACES, APPLIANCES, TOOLS, PUMPS, ETC. ARE RATED BY OUTPUT HORSEPOWER (H.P.), BUT DEPENDING ON SIZE, QUALITY AND LOAD CHARACTERISTICS THE WATTAGE RATING VARIES. IN GENERAL, 1 H.P. OUTPUT EQUALS 1000 WATTS INPUT AT FULL LOAD. HOWEVER, MOTORS ARE GENERALLY SIZED TO RUN AT 70% FULL LOAD.

GAS APPLIANCES

GAS APPLIANCE	TYPICAL GAS INPUT RATING CFH	COST	
AIR CONDITIONERS**			
CENTRAL 3 TON	80	.140*	--HOUR
CENTRAL 5 TON	135	.235*	--HOUR
DRYER			
REGULAR FABRICS	25	.062*	--LOAD
PERMANENT PRESS	18	.050*	--LOAD
FURNACE**			
(JANUARY AVERAGE)	137	.073*	--HOUR
OUTDOOR GRILL (FULL HEAT)	25	.0242	--30 MINUTES
RANGE			
SURFACE UNIT	6	.001	--5 MINUTES
OVEN	30	.030*	--HOUR
WATER HEATER	37	.05-.10	--PER PERSON/DAY
YARD LIGHT	2	.092	--DAY

NOTE: COST INCLUDES BOTH GAS AND ASSOCIATED ELECTRICAL ENERGY USE FOR APPLIANCES, BUT EXCLUDES 3% SALES TAX.

* THERMOSTATICALLY CONTROLLED. COST BASED UPON ESTIMATED PERCENTAGE OF "ON" TIME.

** NATURAL GAS HEATING AND AIR CONDITIONING COSTS VARY WITH EACH INDIVIDUAL HOME. MANY FACTORS ARE NEEDED TO ARRIVE AT AN ACCURATE ESTIMATE: SIZE OF HOME, TYPE OF SYSTEM, AMOUNT OF INSULATION, NUMBER OF DOORS, WINDOWS, ETC.

FIGURE 3

A SUMMARY OF ENERGY CONSERVATION METHODS FOR VARIOUS APPLICATIONS AND ACTIVITIES

After considering the conservation aspects of all the models and specifics of this module, one can summarize in numerical form what the better conservation activities and lifestyle approaches are that help reduce energy costs and utility bills. In general, you as a customer benefit from energy conservation because it:

1. cuts down on your utility and gasoline bills,
2. if you save energy, you help fight against pollution,
3. if you don't save natural gas, petroleum and electricity now, some day none may be available.

The energy conservation methods are grouped under specific appliances and uses. The first list is for general residential and small commercial use, and the second list is for industrial and business use. However, many of the energy conservation practices for business and industry are directly applicable to the home; especially people who have electrical-electronic and audio-visual equipment.

GENERAL RESIDENTIAL AND SMALL COMMERCIAL

Heating

1. In cooler months of the year, set your thermostat at 68° during the daytime, several degrees lower at night (an extra blanket on your bed can make up the difference).
2. Set your thermostat at a comfortable temperature, then leave it alone...turning it up and down wastes energy.
3 Make sure your home has adequate insulation -- install storm windows and doors if you don't have them. Three inches of insulation in attic can save as much as 25% on heating cost over no insulation.
4. Avoid frequent opening of outside doors. Use weatherstripping to seal air leaks around edges.
5. In winter, keep your drapes open to let the sunlight in during the day, close them at night to stop cold drafts.
6. Keep the damper on your chimney closed when not in use.
7. Turn off heat vents and close off rooms that are not in use.
8. Keep filters clean...change them at least twice a year.
9. Consider a switch to solar heating in the future.
10. Remove furniture, rugs, etc., that block heating vents or radiators.
11. Place aluminum foil between radiator and exterior wall to reflect heat into the house.

Air Conditioning

1. During hot months, set your air conditioner on "low" or keep your thermostat at 72° or more...this way you'll use less electricity and feel less uncomfortable when you step outdoors.
2. In summer, close drapes to keep sunlight out (this makes it easier for the air conditioner to keep things cool).
3. If you have a window air conditioner, try to place it in the window with the most shade.
4. Use heat producing major appliances (dishwashers, dryers, ovens, etc.) during early morning or evening...not when your air conditioner is working the hardest.
5. Keep doors and windows closed when air conditioner is operating...and close off unused area.
6. Keep filters clean.
7. Set the thermostat higher if you are away most of the day and turn it off if you're going away for a weekend or longer.
8. Storm windows will help keep the cool air inside.
9. To ease the load on your air conditioning system, consider installing an attic fan to help blow out the trapped hot air.
10. Make sure sofas, bookcase and other solid objects do not obstruct your air conditioner to keep it from operating efficiently.

Hot Water

1. Set your water heater's thermostat at "medium".
2. Encourage showers instead of tub baths to save hot water.
3. Fix leaky faucets (a drip a second wastes 700 gallons a year).
4. Don't wash dishes under running water...a dishwasher uses much less hot water than washing dishes by hand.
5. Run washing machine, dryer, and dishwasher only with full loads. Wash clothes in cold water whenever possible.
6. When on vacation use the water heater's vacation setting. The pilot light will keep burning without using more energy to heat water.
7. Don't waste hot water. For example, don't leave water running while washing hands or shaving--partially fill the basin first.

Lighting

1. Turn off lights when not needed.
2. Keep light bulbs and fixtures clean...that way you may require fewer bulbs.
3. When possible, use fluorescent lamps. A 40-watt fluorescent lamp produces more light than a 100-watt incandescent bulb.
4. Install dimmer controls to save energy and add atmosphere.
5. Rooms with pastel walls and a light-colored interior decor usually require fewer lamps.

Major Appliances - Stove

1. Partially thaw frozen foods before cooking.
2. Put small pots on small burners, large ones on large burners.
3. Cover pots to avoid heat loss.
4. Use high setting on units to start, then reduce heat and food will continue to boil.
5. When cooking with water, use as little as possible so food will heat quickly.
6. When using the oven, preheat only 10 minutes...and don't peek. The oven uses less energy than the stove top because it is a confined space.
7. Avoid using aluminum foil on shelves directly under pans since it can reflect the heat away from them.
8. Cook by time and temperature. A meat thermometer can eliminate over-cooking. Precise timing eliminates wasted heat by peeking.
9. In summer, cook outdoors whenever possible to reduce heat build-up inside. Experiment with a solar cooker.
10. When using gas, regulate burners so flame tips just touch utensil bottoms.
11. A clean oven and broiler cooks more efficiently.
12. Ceramic, glass and stainless steel are best heat retainers (lower oven temperatures by 25°).

Major Appliances - Refrigerator/Freezer

1. Locate refrigerator out of sun and away from heat sources (stove, dishwasher, etc.)
2. Cool foods to room temperature before placing them in refrigerator.
3. Make sure gasket seals door well.
4. Defrost freezer when 1/4" of frost has built up.
5. Keep freezer full, but not overloaded: it uses less energy to keep freezer cold when air can easily circulate around packages.
6. Chill food before placing it in freezer...and don't freeze too many things at once.
7. A chest freezer is more economical than an upright because when the door is opened the cold air settles on the bottom, rather than flowing onto the floor.
8. To avoid excess cold loss, open refrigerator or freezer only when necessary.
9. Check the temperature setting of your refrigerator and freezer against your appliance manual. If you store your food too cold, you will be wasting energy.
10. When preparing to go on vacation, set refrigerator at a warmer temperature and leave it fairly empty.

Major Appliances - Washer & Dryer

1. Keep the lint traps clean to assure top efficiency.
2. Use only when full and as cool a setting as possible (DO NOT OVERLOAD).
3. Use the water level control on your washer...small loads require less hot water.

4. Don't overdry clothes. Save ironing by hanging or folding clothes as soon as they are dry.
5. Your dryer should be located where it has easy access to clean dry air.
6. Use the free solar energy whenever possible.
7. Soak stubborn stains before washing.
8. Check type of soiling and fabric--when possible wash clothes in cold water (except diapers).

Transportation

1. Reduce the amount of driving you must do...instead of 5 or 6 short trips make one well-planned and organized trip.
2. Use car pools to get to work, take kids to school, or even for shopping trips.
3. Use public transportation whenever possible.
4. Use a bicycle for short trips...uses less energy and keeps you in shape at the same time. Or walk.
5. Consider buying a smaller, more efficient car.

Automobile

1. Avoid jack rabbit starts and sudden stops to save gas.
2. Weaving in and out of traffic wastes fuel and can cause needless accidents.
3. Don't waste gasoline by keeping your car running while waiting for someone.
4. Try to hold a constant speed when possible.
5. On hot summer days, park in the shade so the air conditioner doesn't have to work as hard. When possible, drive with the windows open instead of using the air conditioner.
6. Keep your car in top shape...have it tuned regularly.
7. Make sure your tires are properly inflated so you get running errands.
8. If you are a 2-car family, use the smaller one for running errands.
9. Change oil and oil filters every 3,000 to 6,000 miles (according to your owner's manual). A dirty engine wastes gas.
10. Improper wheel alignment cuts down on power, gas mileage and tire mileage!

Appliances - General

1. Follow detergent directions carefully, oversudsing in both dishwashers and washers uses extra energy, because the equipment has to work harder.
2. Use small appliances where possible, rather than large ones. For example, an electric fry pan uses less energy to cook a one pot meal than an electric range.
3. Iron all clothes at the same time to avoid reheating iron later in day or several times in one week.
4. Have gas appliances cleaned regularly so they will always operate at top efficiency.
5. Motor driven appliances, like mixers, are particularly economical.

General

1. Color TV's use more energy than black and white TV's.
2. Always turn off a radio, TV, or record player when no one is watching or listening.
3. When possible use your major appliances during off-peak hours (before 8 a.m. and after 6 p.m.), when commercial and industrial use is less.
4. Keep your swimming pool in top operating condition so it doesn't waste energy.
5. Recycle aluminum, paper, and glass whenever possible.
6. Watch how you water your lawn...a lot of water is wasted when a lawn is saturated and the water starts running into the street.
7. Avoid using extension cords for major appliances and don't overload circuits. Overloading causes reduced energy efficiency.
8. Make your family aware of the energy problem and what they can do about it!

INDUSTRIAL AND BUSINESS

Heating

1. Make sure sufficient insulation is installed.
2. Do not overheat areas...keep the thermostat set at 68° or slightly lower during the winter. (66-70° is recommended for factory areas, 72-74° for general office areas.)
3. Cut heat leakage from building by using caulking and weather stripping around doors and windows.
4. Make sure heat is not left on too far into spring.
5. Reduce or turn off heat in unused areas (warehouses, docks, etc.).
6. Have a control on outside doors so they are not left open during the winter...heating the outdoors.
7. Reduce heating during those times when the space is unoccupied.
8. Check with equipment suppliers or qualified engineers to determine the extent to which your heating, ventilating and air conditioning equipment is suited for its job...is it the best?
9. Consider the practicality of infra-red heaters in high bay areas and warehouses. (It requires less fuel than other kinds of heating because it only heats solid objects in its path...not the air in between.)

Cooling

1. Do not overcool areas...keep the thermostat set at 72° or higher during the summer.
2. Spraying water on building roofs can reduce the effect of solar heat in warm weather.
3. Close off unused areas that do not require cooling.
4. Control outside doors so they are not left open during the summer...cooling the outdoors.

Maintenance

1. Emphasize boiler maintenance. Cleanliness improves its operation.
2. Check stack temperature to make sure you are getting complete combustion.
3. Check the insulation on heat/cold pipes--do machines have to work extra hard because of leaks or a lack of proper insulation.
4. Inspect heat transfer surfaces regularly to make sure they are clean...insuring top efficiency.
5. Be on the alert for hot spots and deterioration in furnaces and pipe systems. (Air leaking into furnaces can cause large losses.)
6. Make sure furnace controls and burners are maintained for best efficiency.

Electricity

1. Turn off lights in empty rooms except where needed for safety and security (i.e. washroom lights).
2. Where possible use fluorescent lighting rather than incandescent bulbs (you get more lighting for less watts).
3. Turn off electrical equipment when not in actual use (i.e. typewriter while you're on the telephone).
4. Check and justify weekend electrical power usage.
5. Are motor actuating controls in proper condition so that motors don't operate unnecessarily?
6. Install automatic controls for outdoor and indoor lighting so electricity is not wasted when it is not needed.
7. Convert to higher voltage electrical systems where practical.

Transportation

1. Reduce amount of driving necessary...instead of many short trips organize errands into one well-planned and organized trip.
2. Encourage car pools and the use of public transportation.
3. Whenever possible ship freight by railroad rather than by air...it requires less energy.
4. Keep company cars and trucks in top-shape...have them turned regularly.

Operations

1. Avoid short runs on thermal process equipment when possible and shut down or idle equipment during production interruptions.
2. In many areas, energy waste is often the result of long unquestioned plant practices that can be shown to have no effect on employee performance or product dependability... re-evaluate.
3. Schedule loads so equipment operates at the top level of efficiency.

4. If possible, reschedule some electrical usage to off-peak periods when voltage remains high. (Before 8 a.m. or after 6 p.m.)

General

1. Waste heat from burner stacks and industrial processes can often be recovered and used.
2. Recycle waste materials (sawdust, oil, etc.) as supplemental fuels where possible.
3. Consider the use of heat pipes for transporting required heat or dissipating unwanted excess heat.
4. Check for accuracy of deliveries of oil, gases, etc.
5. Investigate "new" forms of energy.

These lists were developed using material from the Edmund Scientific Company Manual No. 9903.

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FIGURE 4

E-OK ENERGY EFFICIENT

The N.E.W. Way to an Energy Efficient Home

Rating Sheet

STRUCTURAL ENERGY INTEGRITY ITEMS	Assigned Points	Structural Points
GLASS AREAS (Windows, French and Patio Doors, etc.)		
A. Percent of Glass Area to Floor Area		
Less than 8%	20	
8% to less than 10%	17	
10% to less than 12%	12	
12% to less than 15%	6	
15% to less than 20%	0	
20% to less than 25%	−15	
Greater than 25%	−30	_____
B. Type and Amount of Glass		
Single Glazed	0	
Storm or Double Glazed without Thermal Break		
100% of Glass Area	20	
80% to less than 100% of Glass Area	16	
60% to less than 80% of Glass Area	12	
40% to less than 60% of Glass Area	8	
20% to less than 40% of Glass Area	4	
Less than 20% of Glass Area	0	
Storm or Double Glazed with Thermal Break		
100% of Glass Area	25	
80% to less than 100% of Glass Area	20	
60% to less than 80% of Glass Area	15	
40% to less than 60% of Glass Area	10	
20% to less than 40% of Glass Area	5	
Less than 20% of Glass Area	0	_____
EXTERIOR DOORS (Other Than Glass)		
Solid or Hollow Core	0	
Insulated or Storm Door	4	_____
FLOORS		
Monolithic Slab - with no Perimeter Insulation	0	
Monolithic Slab - with R-5 Perimeter Insulation	5	
Pier & Beam with R-11 Insulation	0	
Pier & Beam with R-19 Insulation	10	
Pier & Beam with Less than R-11 Insulation	−15	_____
OUTSIDE WALLS		
Less than R-7 Insulation Installed	−20	
Less than R-11 Insulation Installed	−10	
R-11 Insulation Installed	0	
R-[illegible] Insulation Installed	10	
R-[illegible] Insulation Installed	15	
R-[illegible] Insulation Installed	17	
R-23 Insulation Installed	20	_____
CEILINGS OVER CONDITIONED AREAS		
R-[illegible] Insulation Installed	0	
R-22 Insulation Installed	12	
R-26 Insulation Installed	20	
R-30 Insulation Installed	25	
R-[illegible] Insulation Installed	30	_____
INFILTRATION OF UNCONDITIONED AIR *		
A. Soleplate Sealed	13	_____
B. Wiring & Plumbing Holes and Furrdowns Sealed	10	_____
C. Exterior Doors & Windows Weather Stripped	3	_____
D. Exterior Doors & Windows Rough Opening Caulked	6	_____
E. Attic Access in Conditioned Space Weather Stripped	2	_____
F. Outside Sheathing Holes Sealed and Polyethylene Film** Installed	3	_____
G. Ventless or Dampered Range Hood Installed	3	_____
FIREPLACES		
Open Fireplace	10	
Fireplace with Damper, Glass Screen & Make Up Air Intake	8	
Fireplace with Damper & Make Up Air Intake	5	
Fireplace with Damper	0	
Fireplace without Damper	−15	_____
STRUCTURAL ITEMS SUB-TOTAL Required Points 90		

MECHANICAL SYSTEM ITEMS	Assigned Points	Mechanical Points
8. ATTIC VENTILATION REQUIREMENT (See Table for Vent Area Required)		
With no Air Handler and/or Duct System in the Attic - 0.4 to 1.0 cfm per sq. ft. of Attic Floor Area "OR"		
With Air Handler and/or Duct System in the Attic - 1.5 to 2.0 cfm per sq. ft. of Attic Floor Area	5	_____
9. DUCT SYSTEM		
Attic Space R-7 Sealed Joints	0	
Attic Space R-14 Sealed Joints	5	
Unconditioned Space or Partial Conditioned	5	
None or Conditioned Space (R-4)	15	_____
10. AIR HANDLER AND/OR HEATING UNIT LOCATION		
Attic Space	0	
Unconditioned Space (Combustion Air to Closet puts the Unit in an Unconditioned Space)	5	
Conditioned Space	15	_____
11. COOLING EFFICIENCIES (Unitary, Window Units, & Heat Pumps) at 95° Outdoor Temperature (ARI Rating or AHAM)		
A. 7.0 EER	0	
7.1 to less than 7.5	5	
7.5 to less than 8.0	10	
8.0 to less than 8.5	15	
8.5 to less than 9.0	20	
9.0 to less than 9.5	25	
9.5 or Greater EER	30	_____
B. Single Unit	0	
Multiple Unit	5	_____
12. HEATING EFFICIENCIES @ 47° Outdoor Temperature		
COP .5 to less than 1.0	0	
1.0 to less than 2.0	8	
2.0 to less than 2.5	12	
2.5 to less than 3.0	16	
3.0 to less than 3.5	20	
3.5 or Greater	24	_____
13. WATER HEATING SYSTEM		
A. Pipe Insulation		
Lines Insulation - Non Circ. System (R-4)	5	
Not Insulated - Non Circ. System	0	
Circ. System	−50	_____
B. Water Heating Location		
Located within 20 ft. of Kitchen & Utility Area	3	_____
C. Heat Recovery or Solar Water Heating	15	_____
STRUCTURAL & MECHANICAL ITEMS TOTAL Required Points 135		

Remember, an E-OK home must earn at least 135 points, and a minimum of 90 of these points must be achieved in construction categories 1 through 7. If the original point rating of your present home in categories 1 through 7 has been increased by a minimum of 35 points, you still qualify for the N.E.W. program.

*The right is reserved to test the structure for infiltration when less than one air change per hour is claimed by Point System.

**This is mandatory when a High Order Vapor Barrier is used on the outside wall.

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